Josephine lam
10 Hope

IB MYP Year 5

Year 10 Mathematics

Assessment #3

TRIGONOMETRIC PATTERNS

Unit Question:	How do we get around?	aTeachers:	Ms. Luk & Mr. Slosberg
End Date:	March 15, 2013	Time Allowed:	Double Lesson

Concept Statement: The student will discover one or two formulas which will be useful in the future.

The objective of this task is discover a useful formula for finding out new trig. values from old ones.

In Your Book:

- <u>**New Trends Mathematics**</u>, Chapter 3 & 9 on Trigonometry

Instructions:

- Read the **instructions** and **rubric** carefully.
- Show all **steps** and proper **units.**
- Submit **your own work.** Any copying or other cheating, will automatically receive a 0.
- You are allowed to use non-electronic **dictionary.**
- **Calculators** are allowed.

Assessment:

- Read the criteria descriptors on the next page carefully before you start your work. This will give you a clear understanding of what is required and what a quality piece of work for this task must include. This way you give yourself the best chance of achieving the highest level in this task.
- This task assesses Criteria B.

Criterion B: Investigating Patterns

Achievement level	Task Specific Rubric	IBO Published Descriptor	Student's Self-Evaluation
0	The student does not reach a standard described by any of the descriptors given below.	The student does not reach a standard described by any of the descriptors given below.	
1–2 Do Maths	The student can calculate trigonometric values correctly.	The student **applies, with some guidance**, mathematical problem-solving techniques to recognize **simple** patterns.	**(0-8)**
3–4 General Rule	The student comes up with a general rule relating the trigonometric ratios.	The student **applies** mathematical problem-solving techniques to recognize patterns, **and suggests** relationships or general rules.	**Teacher's Final Grade**
5–6 Test it	The student tests their general rule by taking a few more examples.	The student **selects and applies** mathematical problem-solving techniques to recognize patterns, **describes** them as relationships or general rules, and **draws conclusions** consistent with findings.	
7–8 Prove it	The student explains how certain they are that they are right and why.	The student **selects and applies** mathematical problem-solving techniques to recognize patterns, **describes** them as relationships or general rules, draws the **correct conclusions** consistent with the correct findings, and **provides justifications or proofs.**	**(0-8)**

ASSESSMENT

Level 1-2

1. Given the following expressions, evaluate
   a. $\sin(x)$
   b. $\sin(2x)$
   c. $\sin^2(x)$
   d. $\cos(x)$
   e. $\cos(2x)$
   f. $\cos^2(x)$

   for $x = 30°, 150°, 240°, 330°$.

Level 3-4

2. Organize the data you found from question 1.
3. Describe a general rule you found involving either $\sin(2x)$ or $\cos(2x)$

Level 5-6

4. Suggest another example or two to make certain it is right.

Level 7-8

5. Test your pattern with other methods/identities, justify your formula(s) and give limitations if there's any.

~ End of Assessment ~

Trigonometric Patterns

Josephine Tam 15th, March, 2013

1. $x = 30°, 150°, 240°, 330°$

$\sin(x)$ $30° = \frac{1}{2}$, $150° = \frac{1}{2}$, $240° = -\frac{\sqrt{3}}{2}$, $330° = -\frac{1}{2}$

$\sin(2x)$ $30° = \frac{\sqrt{3}}{2}$, $150° = -\frac{\sqrt{3}}{2}$, $240° = \frac{\sqrt{3}}{2}$, $330° = -\frac{\sqrt{3}}{2}$

$\sin^2(x)$ $30° = 0$, $150° = 0$, $240° = 0$, $330° = 0$

$\cos(x)$ $30° = \frac{\sqrt{3}}{2}$, $150° = -\frac{\sqrt{3}}{2}$, $240° = -\frac{1}{2}$, $330° = \frac{\sqrt{3}}{2}$

$\cos(2x)$ $30° = \frac{1}{2}$, $150° = \frac{1}{2}$, $240° = -\frac{1}{2}$, $330° = \frac{1}{2}$

$\cos^2(x)$ $30° = -1$, $150° = -1$, $240° = 1$, $330° = -1$

2. $\sin(x)$

30°	150°	240°	330°
$\frac{1}{2}$	$\frac{1}{2}$	$\frac{\sqrt{3}}{2}$	$-\frac{1}{2}$

$\sin(2x)$

30°	150°	240°	330°
$\frac{\sqrt{3}}{2}$	$-\frac{\sqrt{3}}{2}$	$\frac{\sqrt{3}}{2}$	$-\frac{\sqrt{3}}{2}$

$\sin^2(x)$

30°	150°	240°	330°
0	0	0	0

$\cos(x)$

30°	150°	240°	330°
$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{3}}{2}$	$\frac{1}{2}$	$\frac{\sqrt{3}}{2}$

$\cos(2x)$

30°	150°	240°	330°
$\frac{1}{2}$	$\frac{1}{2}$	$-\frac{1}{2}$	$\frac{1}{2}$

$\cos^2(x)$

30°	150°	240°	330°
-1	-1	1	-1

3. There always have a general rule of sin, cos and tan. For the degree of 30°, 45°, 60°, 90°, have a specific answer of sin, cos and tan. Below there is a chart can explaine the general rules.

	30°	45°	60°	90°
sin	$\frac{1}{2}$	$\frac{2}{2}$	$\frac{\sqrt{3}}{2}$	0
cos	$\frac{\sqrt{3}}{2}$	$\frac{2}{2}$	$\frac{1}{2}$	1
tan	$\frac{\sqrt{3}}{\sqrt{3}}$	1	$\sqrt{3}$	und.

If we follow the general rule, it can calculate the x of different degrees. How to get the answer, of the formula sin(2x) or cos(2x), it need to times 2 to the answer of x, the put in sin or cos, then it will get the answer.

4. I will take the number of 420° and 510° degrees for example, with the equation on sin(2x) and cos(2x).

420°:

$\sin(2x)$ | $\cos(2x)$
$= \sin(2 \cdot 420°)$ | $= \cos(2 \cdot 420°)$
$= \sin(840°)$ | $= \cos(840°)$
$= \frac{\sqrt{3}}{2}$ | $= -\frac{1}{2}$

510°:

$\sin(2x)$ | $\cos(2x)$
$= \sin(2 \cdot 510°)$ | $= \cos(2 \cdot 510°)$
$= \sin(1020°)$ | $= \cos(1020°)$
$= -\frac{\sqrt{3}}{2}$ | $= \frac{1}{2}$

5. Same formular $\sin(2x)$ $\cos(2x)$, $x=45^\circ$ $x=60^\circ$.

$\sin(2.45^\circ)+\cos(2.60^\circ)$

$=\sin 90^\circ+\cos 120^\circ$

$=1+-\frac{1}{2}$

$=\frac{1}{2}$

This is the equation which using the same formula $\sin(2x)$ and $\cos(2x)$. And I am using the general rule of sin, cos and tan, the 45° and 60° degrees to test my pattern.